

Ezi-SERVO[®]

Closed Loop Stepping Systems

ST



Fast, Accurate, Smooth Motion

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※ Before operation ※

- Thank you for your purchasing Ezi-SERVO ST.
- Ezi-SERVO ST is an all-in-one Unit. For high-speed and high-precision drive of a stepping motor, Ezi-SERVO ST is a unique drive that adopts a new control scheme owing to an on-board high-performance 32bit digital signal processor.
- This manual describes handling, maintenance, repair, diagnosis and troubleshooting of Ezi-SERVO ST.
- Before operating Ezi-SERVO ST, thoroughly read this manual.
- After reading the manual, keep the manual near the Ezi-SERVO ST so that any user can read the manual whenever needed.

1. Precautions

◆ General Precautions

- Contents of this manual are subject to change without prior notice for functional improvement, change of specifications or user's better understanding. Thoroughly read the manual provided with the purchased Ezi-SERVO ST.
- When the manual is damaged or lost, please contact with Fastech's agents or our company at the address on the last page of the manual.
- Our company is not responsible for a product breakdown due to user's dismantling for the product, and such a breakdown is not guaranteed by the warranty.

◆ Put the Safety First

- Before installation, operation and repairing the Ezi-SERVO ST, thoroughly read the manual and fully understand the contents. Before operating the Ezi-SERVO ST please, understand the mechanical characteristics of the Ezi-SERVO ST and related safety information and precautions.
- This manual divides safety precautions into **Attention** and **Warning**.

 **Attention** : If user does not properly handle the product, the user may seriously or slightly injured and damages may occur in the machine.

 **Warning** : If user does not properly handle the product, a dangerous situation (such as an electric shock) may occur resulting in deaths or serious injuries.

- Although precaution is only a **Attention**, a serious result could be caused depending on the situation. Follow safety precautions.

◆ Check the Product

 Attention	Check the Product is damaged or parts are missing. Otherwise, the machine may get damaged or the user may get injured.
--	---

◆ Installation

 Attention	Carefully move the Ezi-SERVO ST. Otherwise the Product may get damaged or User's foot may get injured by dropping the product. Use non-flammable materials such as metal in the place where the Ezi-SERVO ST is to be installed. Otherwise, a fire may occur. When installing several Ezi-SERVO ST in a sealed place, install a cooling fan to keep the ambient temperature of the Ezi-SERVO ST as 50°C or lower. Otherwise, a fire or other kinds of accidents may occur due to overheating.
 Warning	The process of Installation, Connection, Operation, Checking and Repairing should be done with qualified person. Otherwise, a fire or other kinds of accidents may occur.

◆ Connect Cables

 Attention	Keep the rated range of Input Voltage for Ezi-SERVO ST. Otherwise, a fire or other kinds of accidents may occur. Cable connection should follow the wiring diagram. Otherwise, a fire or other kinds of accidents may occur.
 Warning	Before connecting cables, check if input power is off. Otherwise, an electric shock or a fire may occur. The case of the Ezi-SERVO ST is insulated from the ground of the internal circuit by the condenser. Ground the Ezi-SERVO ST. Otherwise, an electric shock or a fire may occur.

◆ Operation



Attention

If a protection function(alarm) occurs, firstly remove its cause and then release(alarm reset) the protection function.

If you operate continuously without removing its cause, the machine may get damaged or the user may get injured.

Do not make Motor Free and make input signal to ON during operation.

Motor will stop and stop current will become zero. The machine may get damaged or the user may get injured.

Make all input signals to OFF before supply input voltage to Ezi-SERVO ST.

The machine may get damaged or the user may get injured by motor operation.

All parameter values are set by default factory setting value. Change this value after reading this manual thoroughly.

Otherwise, the machine may get damaged or other kinds of accidents may occur.

◆ Check and Repair



Warning

Stop to supply power to the main circuit and wait for a while before checking or repairing the Ezi-SERVO ST.

Electricity remaining in the capacitor may cause danger.

Do not change cabling while power is being supplied.

Otherwise, the user may get injured or the product may get damaged.

Do not reconstruct the Ezi-SERVO ST.

Otherwise, an electric shock may occur or the reconstructed product can not get After-Service.

■ Part Numbering

Ezi-SERVO-42S-A-□

Closed Loop Stepping System Name	
Motor Flange Size	
20 : 20mm 28 : 28mm 42 : 42mm 56 : 56mm 60 : 60mm 86 : 86mm	
Motor Length	
S : Single M : Middle L : Large XL: Extra Large	
Encoder Resolution	
A : 10,000/Rev. B : 20,000/Rev. C : 32,000/Rev. D : 16,000/Rev. F : 4,000/Rev.	
Motor Type	
Blank : Standard L : Low Vibration H : High Speed	

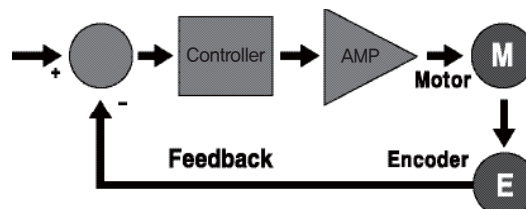
■ Combination List of Ezi-SERVO ST

Unit Part Number	Motor Model Number	Drive Model Number
Ezi-SERVO-20M-F	EzM-20M-F	EzS-PD-20M-F
Ezi-SERVO-20L-F	EzM-20L-F	EzS-PD-20L-F
Ezi-SERVO-28S-D	EzM-28S-D	EzS-PD-28S-D
Ezi-SERVO-28M-D	EzM-28M-D	EzS-PD-28M-D
Ezi-SERVO-28L-D	EzM-28L-D	EzS-PD-28L-D
Ezi-SERVO-42S-A	EzM-42S-A	EzS-PD-42S-A
Ezi-SERVO-42S-B	EzM-42S-B	EzS-PD-42S-B
Ezi-SERVO-42S-C	EzM-42S-C	EzS-PD-42S-C
Ezi-SERVO-42M-A	EzM-42M-A	EzS-PD-42M-A
Ezi-SERVO-42M-B	EzM-42M-B	EzS-PD-42M-B
Ezi-SERVO-42M-C	EzM-42M-C	EzS-PD-42M-C
Ezi-SERVO-42L-A	EzM-42L-A	EzS-PD-42L-A
Ezi-SERVO-42L-B	EzM-42L-B	EzS-PD-42L-B
Ezi-SERVO-42L-C	EzM-42L-C	EzS-PD-42L-C
Ezi-SERVO-42XL-A	EzM-42XL-A	EzS-PD-42XL-A
Ezi-SERVO-42XL-B	EzM-42XL-B	EzS-PD-42XL-B
Ezi-SERVO-42XL-C	EzM-42XL-C	EzS-PD-42XL-C
Ezi-SERVO-56S-A	EzM-56S-A	EzS-PD-56S-A
Ezi-SERVO-56S-B	EzM-56S-B	EzS-PD-56S-B
Ezi-SERVO-56S-C	EzM-56S-C	EzS-PD-56S-C
Ezi-SERVO-56M-A	EzM-56M-A	EzS-PD-56M-A
Ezi-SERVO-56M-B	EzM-56M-B	EzS-PD-56M-B
Ezi-SERVO-56M-C	EzM-56M-C	EzS-PD-56M-C
Ezi-SERVO-56L-A	EzM-56L-A	EzS-PD-56L-A
Ezi-SERVO-56L-B	EzM-56L-B	EzS-PD-56L-B
Ezi-SERVO-56L-C	EzM-56L-C	EzS-PD-56L-C
Ezi-SERVO-60S-A	EzM-60S-A	EzS-PD-60S-A
Ezi-SERVO-60S-B	EzM-60S-B	EzS-PD-60S-B
Ezi-SERVO-60S-C	EzM-60S-C	EzS-PD-60S-C
Ezi-SERVO-60M-A	EzM-60M-A	EzS-PD-60M-A
Ezi-SERVO-60M-B	EzM-60M-B	EzS-PD-60M-B
Ezi-SERVO-60M-C	EzM-60M-C	EzS-PD-60M-C
Ezi-SERVO-60L-A	EzM-60L-A	EzS-PD-60L-A
Ezi-SERVO-60L-B	EzM-60L-B	EzS-PD-60L-B
Ezi-SERVO-60L-C	EzM-60L-C	EzS-PD-60L-C
Ezi-SERVO-86M-A	EzM-86M-A	EzS-PD-86M-A
Ezi-SERVO-86M-B	EzM-86M-B	EzS-PD-86M-B
Ezi-SERVO-86L-A	EzM-86L-A	EzS-PD-86L-A
Ezi-SERVO-86L-B	EzM-86L-B	EzS-PD-86L-B
Ezi-SERVO-86XL-A	EzM-86XL-A	EzS-PD-86XL-A
Ezi-SERVO-86XL-B	EzM-86XL-B	EzS-PD-86XL-B

2. Main characteristics

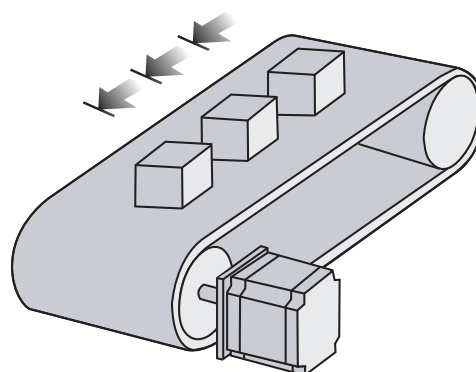
1 Closed Loop System.

Ezi-SERVO® is an innovative closed loop stepping motor and controller that utilizes a high-resolution motor mounted encoder to constantly monitor the motor shaft position. The encoder feedback feature allows the Ezi-SERVO® to update the current motor shaft position information every 25 micro seconds. This allows the Ezi-SERVO® drive to compensate for the loss of position, ensuring accurate positioning. For example, due to a sudden load change, a conventional stepper motor and drive could lose a step creating a positioning error and a great deal of cost to the end user!



2 No Gain Tuning

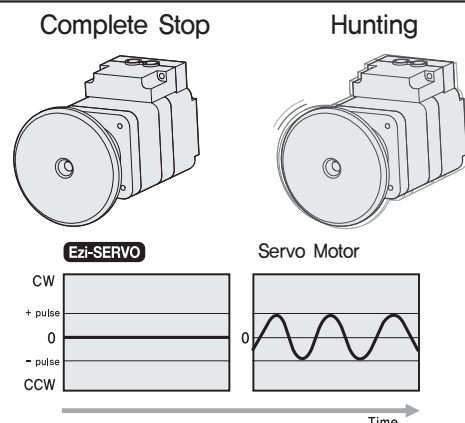
Conventional servo systems, to ensure machine performance, smoothness, positional error and low servo noise, require the adjustment of its servo's gains as an initial crucial step. Even systems that employ auto-tuning require manual tweaking after the system is installed, especially if more than one axis are interdependent. Ezi-SERVO® employs the best characteristics of stepper and closed loop motion controls and algorithms to eliminate the need of tedious gain tuning required for conventional closed loop servo systems. This means that Ezi-SERVO® is optimized for the application and ready to work right out of the box! The Ezi-SERVO® system employs the unique characteristics of the closed loop stepping motor control, eliminating these cumbersome steps and giving the engineer a high performance servo system without wasting setup time. Ezi-SERVO® is especially well suited for low stiffness loads (for example, a belt and pulley system) that some-time require conventional servo systems to inertia match with the added expense and bulk of a gearbox. Ezi-SERVO® also performs exceptionally, even under heavy loads and high speeds!



Belt and Pulley System

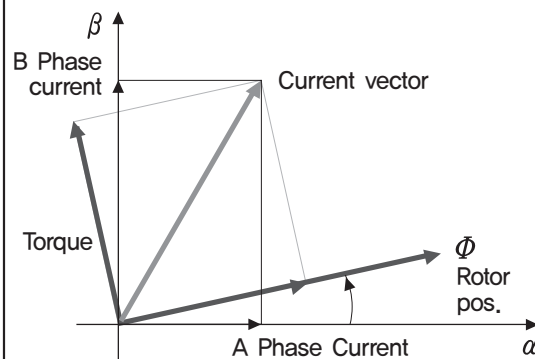
3 No Hunting

Traditional servo motor drives overshoot their position and try to correct by overshooting the opposite direction, especially in high gain applications. This is called null hunt and is especially prevalent in systems that the break away or static friction is significantly higher than the running friction. The cure is lowering the gain, which affects accuracy or using Ezi-SERVO® Motion Control System! Ezi-SERVO® utilizes the unique characteristics of stepping motors and locks itself into the desired target position, eliminating Null Hunt. This feature is especially useful in applications such as nanotech manufacturing, semiconductor fabrication, vision systems and ink jet printing in which system oscillation and vibration could be a problem.



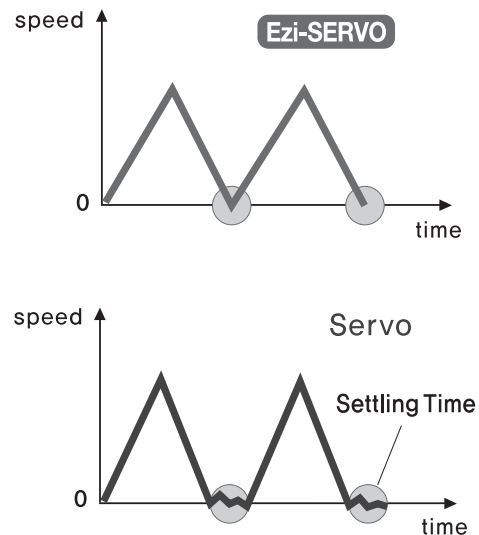
4 Smooth and Accurate

Ezi-SERVO® is a high-precision servo drive, using a high-resolution encoder with 32,000 pulses/revolution. Unlike a conventional Microstep drive, the on-board high performance DSP (Digital Signal Processor) performs vector control and filtering, producing a smooth rotational control with minimum ripples.



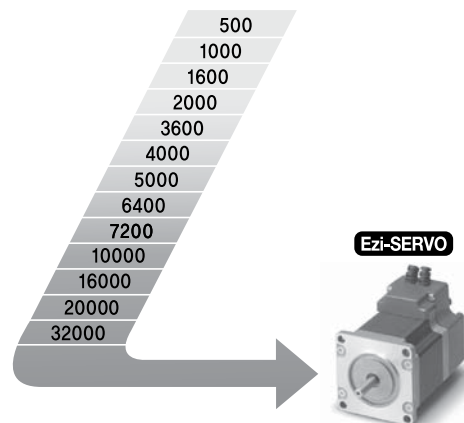
5 Fast Response

Similar to conventional stepping motors, Ezi-SERVO® instantly synchronizes with command pulses providing fast positional response. Ezi-SERVO® is the optimum choice when zero-speed stability and rapid motions within a short distance are required. Traditional servo motor systems have a natural delay between the commanding input signals and the resultant motion because of the constant monitoring of the current position, necessitating in a waiting time until it settles, called settling time.



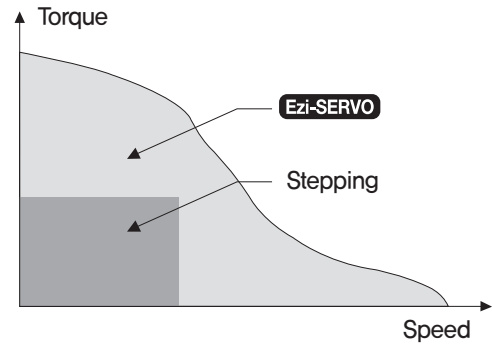
6 High Resolution

The unit of the position command can be divided precisely. (Max. 32,000 pulses/revolution)



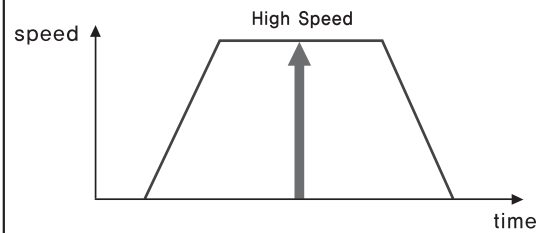
7 High Torque

Compared with common step motors and drives, Ezi-SERVO® motion control systems can maintain a high torque state over relatively long period of time. This means that Ezi-SERVO continuously operates without loss of position under 100% of the load. Unlike conventional Microstep drives, Ezi-SERVO® exploits continuous high-torque operation during high-speed motion due to its innovative optimum current phase control.



8 High Speed

The Ezi-SERVO® functions well at high speed without the loss of Synchronism or positioning error. Ezi-SERVO®'s ability of continuous monitoring of current position enables the stepping motor to generate high-torque, even under a 100% load condition.

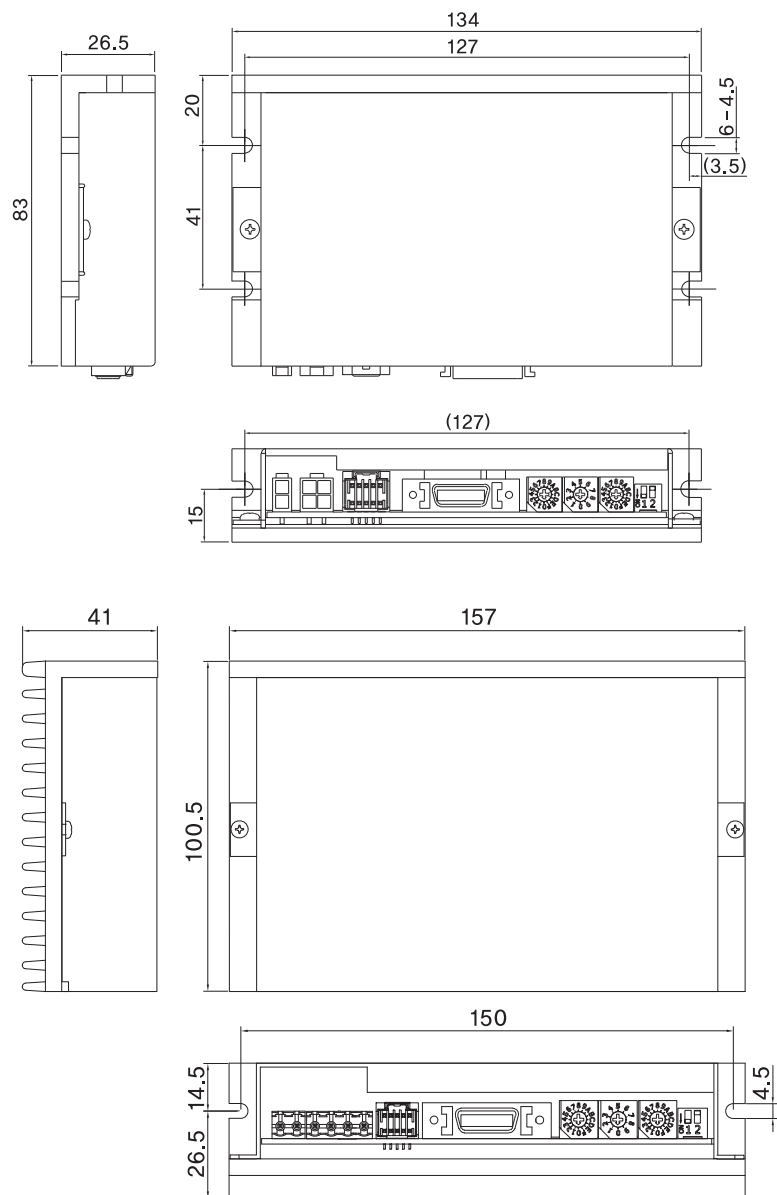


3. Drive Specification and Dimension

3.1 Drive specification

Motor Model		EzM-20 series	EzM-25 series	EzM-28 series	EzM-35 series	EzM-42 series	EzM-56 series	EzM-60 series	EzM-71 series	EzM-86 series
Driver Model		EzS-PD-20 series	EzS-PD-25 series	EzS-PD-28 series	EzS-PD-35 series	EzS-PD-42 series	EzS-PD-56 series	EzS-PD-60 series	EzS-PD-71 series	EzS-PD-86 series
Input Voltage		24VDC $\pm 10\%$								40~70VDC
Control Method		Closed loop control with 32bit DSP								
Current Consumption		Max 500mA (Except motor current)								
Operating Condition	Ambient Temperature	In Use : 0~50°C In Storage : -20~70°C								
	Humidity	In Use : 35~85% (Non-Condensing) In Storage : 10~90% (Non-Condensing)								
	Vib. Resist.	0.5G								
Function	Rotation Speed	0~3000rpm								
	Resolution(P/R)	4,000/Rev. Encoder model : 500 1,000 1,600 2,000 3,600 5,000 6,400 7,200 10,000 4,000 10,000/Rev. Encoder model : 500 1,000 1,600 2,000 3,600 5,000 6,400 7,200 10,000 16,000/Rev. Encoder model : 500 1,000 1,600 2,000 3,600 5,000 6,400 7,200 10,000 16,000 20,000/Rev. Encoder model : 500 1,000 1,600 2,000 3,600 5,000 6,400 7,200 10,000 20,000 32,000/Rev. Encoder model : 500 1,000 1,600 2,000 3,600 5,000 6,400 7,200 10,000 32,000 (Selectable with Rotary switch)								
	Max. Input Pulse Frequency	500KHz (Duty 50%)								
	Protection Functions	Over Current Error, Over Speed Error, Position Tracking Error, Over Load Error, Over Temperature Error, Over Regenerated Voltage Error, Motor Connect Error, Encoder Connect Error, Motor Voltage Error, In-Position Error, System Error, ROM Error, Input Voltage Error, Position Overflow Error								
	LED Display	Power status, In-Position status, Servo On status, Alarm status								
	In-Position Selection	0~F (Selectable with Rotary switch)								
	Position Gain Selection	0~F (Selectable with Rotary switch)								
	Pulse Input Method	1-Pulse / 2-Pulse (Selectable with DIP switch)								
	Rotational Direction	CW / CCW (Selectable with DIP switch)								
	Speed/Position Control Command	Pulse Train Input								
I/O Signal	Input Signals	Position Command Pulse, Servo On/Off, Alarm Reset (Photocoupler Input)								
	Output Signals	In-Position, Alarm (Photocoupler Output) Encoder Signal (A+, A-, B+, B-, Z+, Z-, 26C31 of Equivalent) (Line Driver Output)								

3.2 Drive dimension(mm)



※Only for 86mm motor drive(EzS-PD-86 Series)

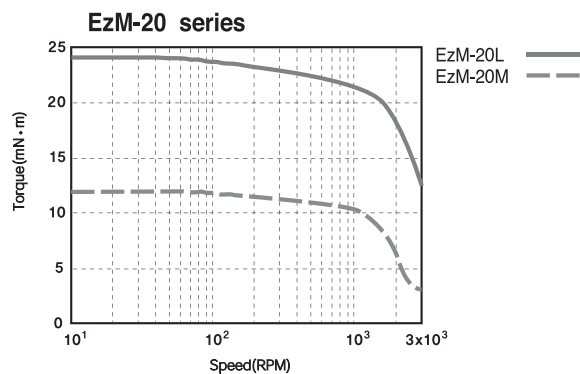
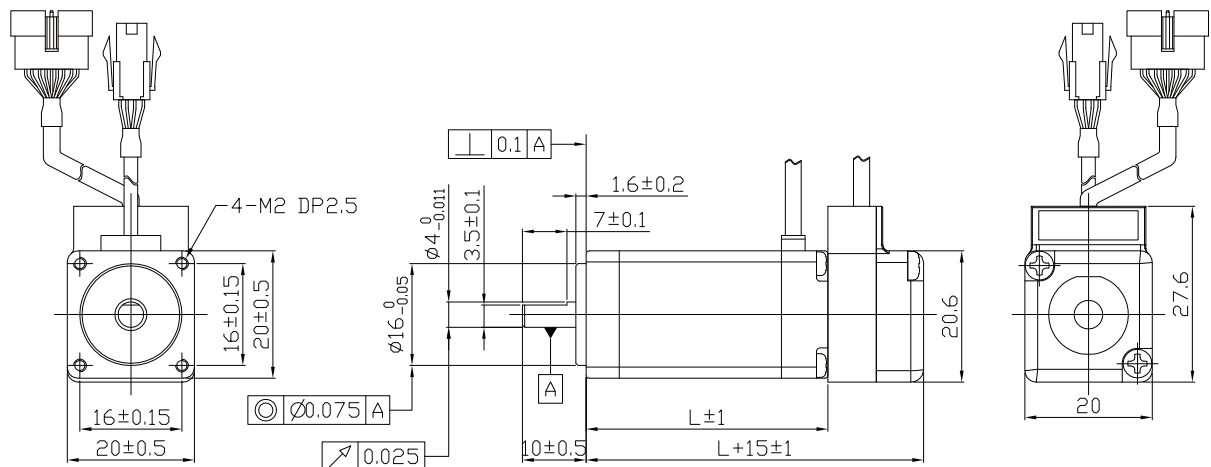
4. Motor specifications and Size

4.1 EzM-20 Series

4.1.1 Motor Specifications

M O D E L		UNIT	EzM-20M-F	EzM-20L-F
DRIVE METHOD		----	BI-POLAR	BI-POLAR
NUMBER OF PHASES		----	2	2
VOLTAGE		VDC	2.9	3.0
CURRENT per PHASE		A	0.5	0.5
RESISTANCE per PHASE		Ohm	5.8	6.0
INDUCTANCE per PHASE		mH	2.0	2.6
HOLDING TORQUE		N · m	0.013	0.026
ROTOR INERTIA		g · cm ²	2.5	3.3
WEIGHTS		g	50	80
LENGTH (L)		mm	28	38
ALLOWABLE OVERHUNG LOAD (DISTANCE FROM END OF SHAFT)	3mm	N	18	18
	8mm		30	30
ALLOWABLE THRUST LOAD		N	Lower than motor weight	
INSULATION RESISTANCE		MOhm	100MOhm (at 500VDC)	
INSULATION CLASS		----	CLASS B (130°C)	
OPERATING TEMPERATURE		°C	0 to 55	

4.1.2 Motor Dimension (mm)



※ Measured Condition

Motor Voltage = 24VDC

Motor Current = Rated Current(Refer to Motor Specification)

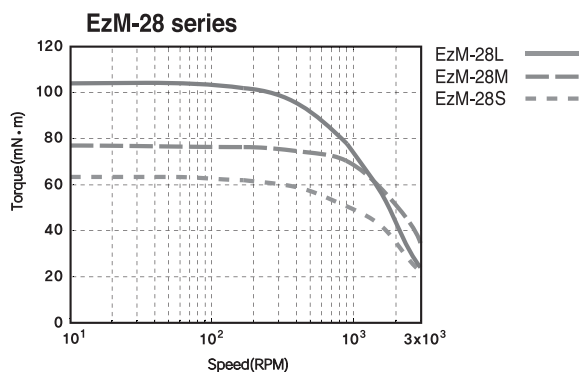
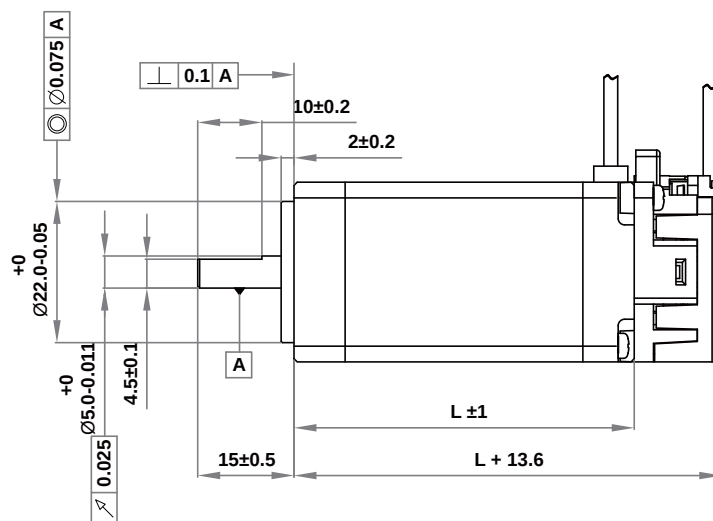
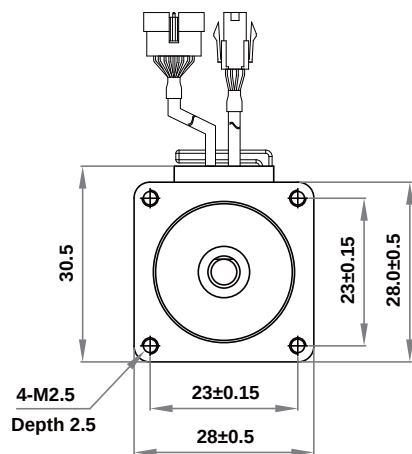
Drive = Ezi-SERVO ST

4.3 EzM-28 Series

4.3.1 Motor Specifications

M O D E L		UNIT	EzM-28S-D	EzM-28M-D	EzM-28L-D
DRIVE METHOD		----	BI-POLAR	BI-POLAR	BI-POLAR
NUMBER OF PHASES		----	2	2	2
VOLTAGE		VDC	3.04	3.04	3.42
CURRENT per PHASE		A	0.95	0.95	0.95
RESISTANCE per PHASE		Ohm	3.2	3.2	3.6
INDUCTANCE per PHASE		mH	2.0	2.6	3.2
HOLDING TORQUE		N · m	0.065	0.08	0.11
ROTOR INERTIA		$g \cdot cm^2$	9	13	18
WEIGHTS		g	110	140	200
LENGTH (L)		mm	32	45	52
ALLOWABLE OVERHUNG LOAD (DISTANCE FROM END OF SHAFT)	3mm	N	30	30	30
	8mm		38	38	38
	13mm		53	53	53
ALLOWABLE THRUST LOAD		N	Lower than motor weight		
INSULATION RESISTANCE		MOhm	100MOhm (at 500VDC)		
INSULATION CLASS		----	CLASS B (130°C)		
OPERATING TEMPERATURE		°C	0 to 55		

4.3.2 Motor Dimension (mm) and Torque Characteristics



※Measured Condition

Motor Voltage = 24VDC

Motor Current = Rated Current(Refer to Motor Specification)

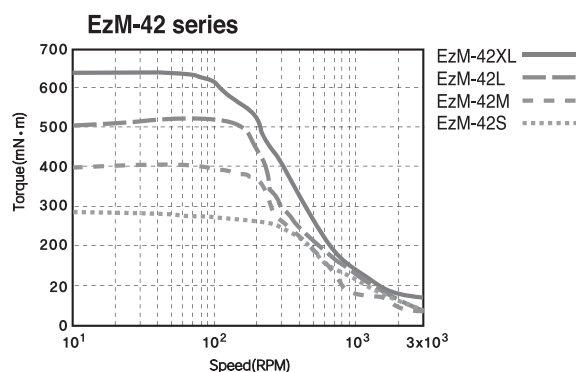
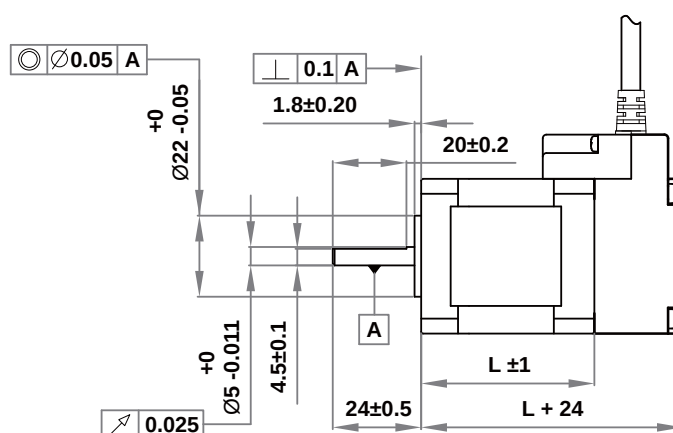
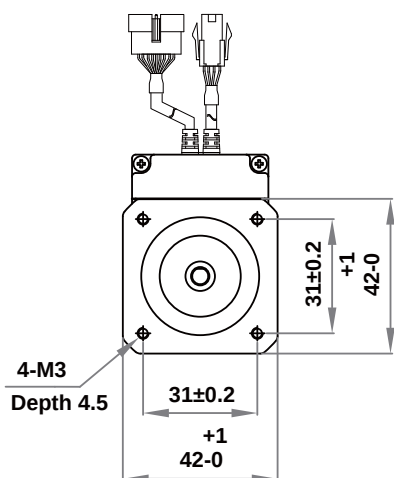
Drive = Ezi-SERVO ST

4.5 EzM-42 Series

4.5.1 Motor Specifications

M O D E L		UNIT	EzM-42S-A EzM-42S-B EzM-42S-C	EzM-42M-A EzM-42M-B EzM-42M-C	EzM-42L-A EzM-42L-B EzM-42L-C	EzM-42XL-A EzM-42XL-B EzM-42XL-C
DRIVE METHOD		----	BI-POLAR	BI-POLAR	BI-POLAR	BI-POLAR
NUMBER OF PHASES		----	2	2	2	2
VOLTAGE		VDC	3.36	4.32	4.56	7.2
CURRENT per PHASE		A	1.2	1.2	1.2	1.2
RESISTANCE per PHASE		Ohm	2.8	3.6	3.8	6
INDUCTANCE per PHASE		mH	5.4	7.2	8.0	15.6
HOLDING TORQUE		N · m	0.32	0.44	0.5	0.65
ROTOR INERTIA		g · cm ²	34	40	48	60
WEIGHTS		g	220	280	350	500
LENGTH (L)		mm	33	39	47	59
ALLOWABLE OVERHUNG LOAD (DISTANCE FROM END OF SHAFT)	3mm	N	22	22	22	22
	8mm		26	26	26	26
	13mm		33	33	33	33
	18mm		46	46	46	46
ALLOWABLE THRUST LOAD		N	Lower than motor weight			
INSULATION RESISTANCE		MOhm	100MOhm (at 500VDC)			
INSULATION CLASS		----	CLASS B (130°C)			
OPERATING TEMPERATURE		°C	0 to 55			

4.5.2 Motor Dimension (mm) and Torque Characteristics

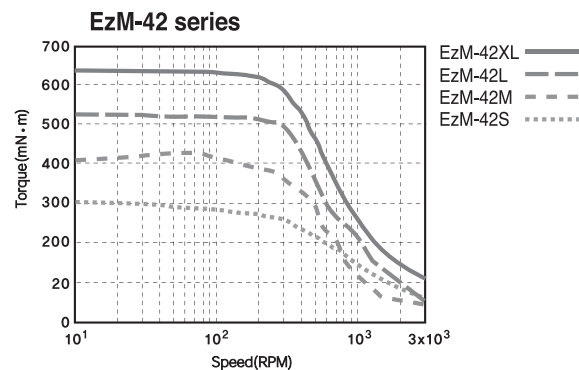


※Measured Condition

Motor Voltage = 24VDC

Motor Current = Rated Current(Refer to Motor Specification)

Drive = Ezi-SERVO ST



※Measured Condition

Motor Voltage = 40VDC

Motor Current = Rated Current(Refer to Motor Specification)

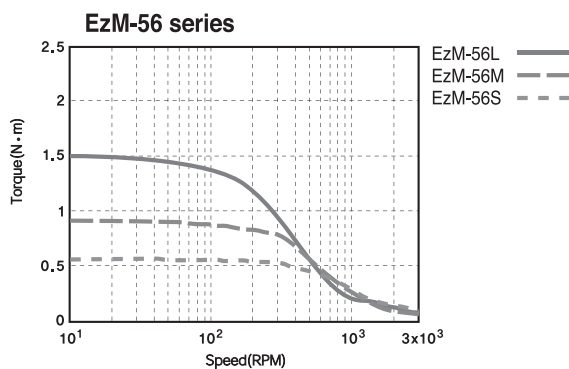
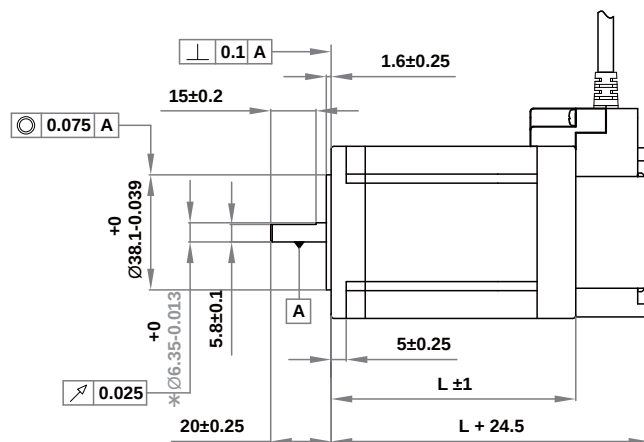
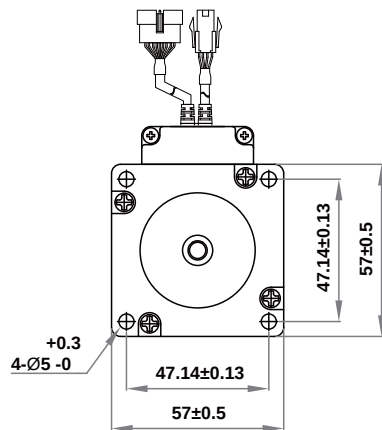
Drive = Ezi-SERVO ST

4.6 EzM-56 Series

4.6.1 Motor Specifications

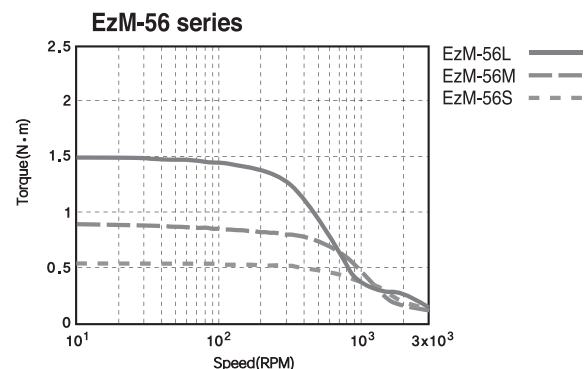
M O D E L		UNIT	EzM-56S-A EzM-56S-B EzM-56S-C	EzM-56M-A EzM-56M-B EzM-56M-C	EzM-56L-A EzM-56L-B EzM-56L-C
DRIVE METHOD		----	BI-POLAR	BI-POLAR	BI-POLAR
NUMBER OF PHASES		----	2	2	2
VOLTAGE		VDC	1,56	2,1	2,7
CURRENT per PHASE		A	3	3	3
RESISTANCE per PHASE		Ohm	0,52	0,54	0,88
INDUCTANCE per PHASE		mH	1,2	2,0	4,0
HOLDING TORQUE		N · m	0,64	1,0	1,5
ROTOR INERTIA		g · cm ²	180	280	520
WEIGHTS		g	500	700	1150
LENGTH (L)		mm	46	54	80
ALLOWABLE OVERHUNG LOAD (DISTANCE FROM END OF SHAFT)	3mm	N	52	52	52
	8mm		65	65	65
	13mm		85	85	85
	18mm		123	123	123
ALLOWABLE THRUST LOAD		N	Lower than motor weight		
INSULATION RESISTANCE		MOhm	100MOhm (at 500VDC)		
INSULATION CLASS		----	CLASS B (130°C)		
OPERATING TEMPERATURE		°C	0 to 55		

4.6.2 Motor Dimension(mm) and Torque Characteristics



※Measured Condition

Motor Voltage = 24VDC
 Motor Current = Rated Current(Refer to Motor Specification)
 Drive = Ezi-SERVO ST



※Measured Condition

Motor Voltage = 40VDC
 Motor Current = Rated Current(Refer to Motor Specification)
 Drive = Ezi-SERVO ST

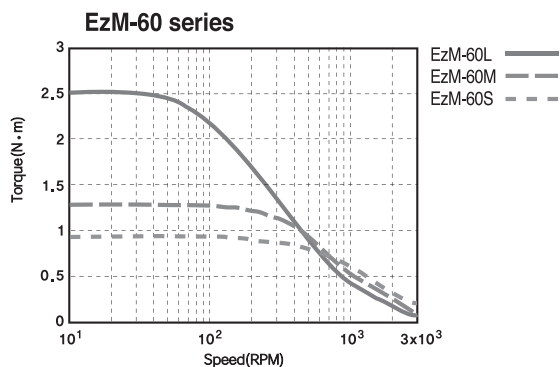
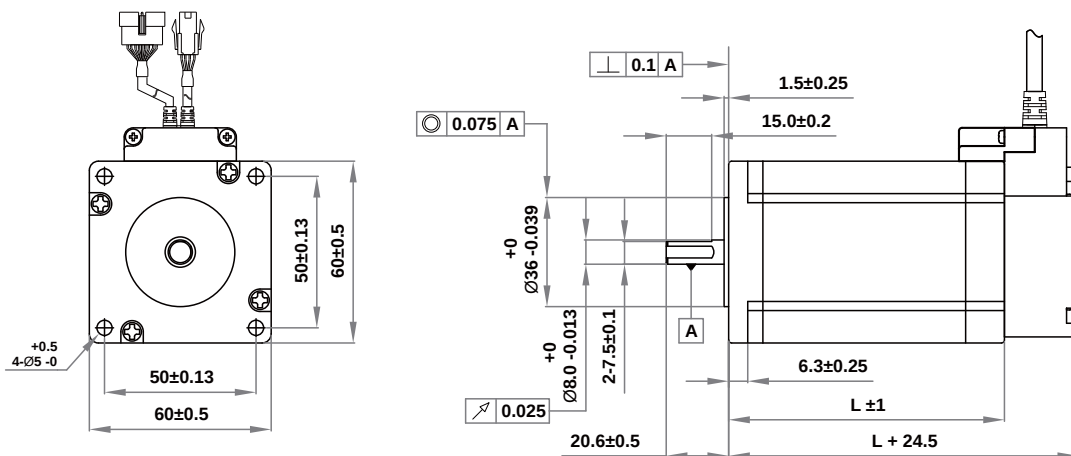
* : There are 2 kinds size of front shaft diameter for EzM-56 series as Ø6,35 and Ø8,0.

4.7 EzM-60 Series

4.7.1 Motor Specifications

M O D E L	UNIT	EzM-60S-A EzM-60S-B EzM-60S-C	EzM-60M-A EzM-60M-B EzM-60M-C	EzM-60L-A EzM-60L-B EzM-60L-C
DRIVE METHOD	----	BI-POLAR	BI-POLAR	BI-POLAR
NUMBER OF PHASES	----	2	2	2
VOLTAGE	VDC	1,52	1,56	2,2
CURRENT per PHASE	A	4	4	4
RESISTANCE per PHASE	Ohm	0.33	0.37	0.55
INDUCTANCE per PHASE	mH	0.75	1.2	2.7
HOLDING TORQUE	N · m	0.88	1.28	2.4
ROTOR INERTIA	g · cm ²	240	440	690
WEIGHTS	g	600	1000	1300
LENGTH (L)	mm	46	56	85
ALLOWABLE OVERHUNG LOAD (DISTANCE FROM END OF SHAFT)	3mm	N	70	70
	8mm		87	87
	13mm		114	114
	18mm		165	165
ALLOWABLE THRUST LOAD	N	Lower than motor weight		
INSULATION RESISTANCE	MOhm	100MOhm (at 500VDC)		
INSULATION CLASS	----	CLASS B (130°C)		
OPERATING TEMPERATURE	°C	0 to 55		

4.7.2 Motor Dimension(mm) and Torque Characteristics

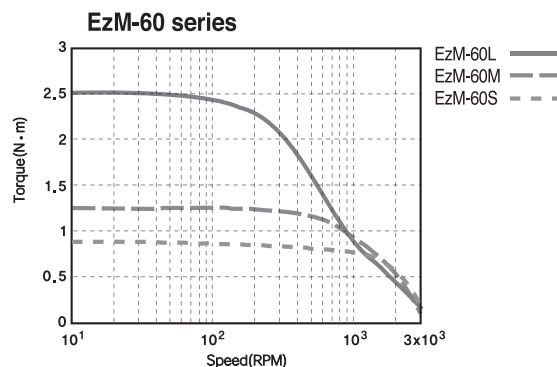


※ Measured Condition

Motor Voltage = 24VDC

Motor Current = Rated Current(Refer to Motor Specification)

Drive = Ezi-SERVO ST



※ Measured Condition

Motor Voltage = 40VDC

Motor Current = Rated Current(Refer to Motor Specification)

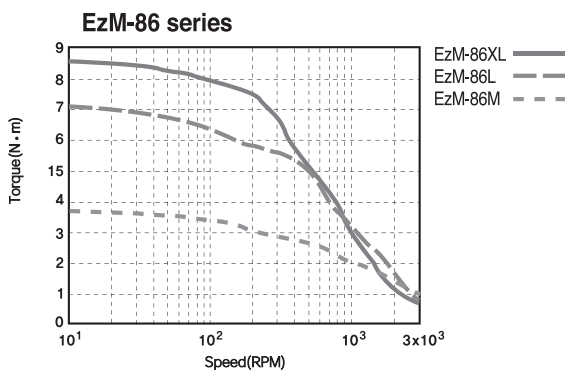
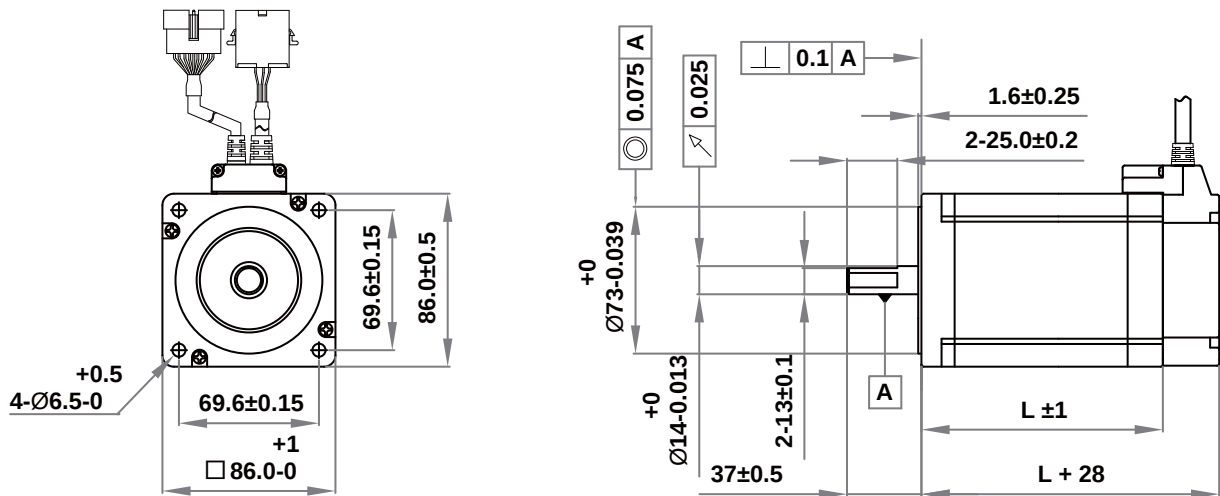
Drive = Ezi-SERVO ST

4.9 EzM-86 Series

4.9.1 Motor Specifications

M O D E L		UNIT	EzM-86M-A	EzM-86L-A	EzM-86XL-A
DRIVE METHOD		----	BI-POLAR	BI-POLAR	BI-POLAR
NUMBER OF PHASES		----	2	2	2
VOLTAGE		VDC	2.4	3.6	4.8
CURRENT per PHASE		A	6	6	6
RESISTANCE per PHASE		Ohm	0.39	0.6	0.8
INDUCTANCE per PHASE		mH	3.0	6.5	8.68
HOLDING TORQUE		N · m	4.0	7.5	12
ROTOR INERTIA		g · cm ²	1800	3600	5400
WEIGHTS		Kg	2.3	3.8	5.3
LENGTH (L)		mm	79	117	155
ALLOWABLE OVERHUNG LOAD (DISTANCE FROM END OF SHAFT)	3mm	N	270	270	270
	8mm		300	300	300
	13mm		350	350	350
	18mm		400	400	400
ALLOWABLE THRUST LOAD		N	Lower than motor weight		
INSULATION RESISTANCE		MOhm	100MOhm (at 500VDC)		
INSULATION CLASS		----	CLASS B (130°C)		
OPERATING TEMPERATURE		°C	0 to 55		

4.9.2 Motor Dimension(mm) and Torque Characteristics



※ Measured Condition

Motor Voltage = 70VDC

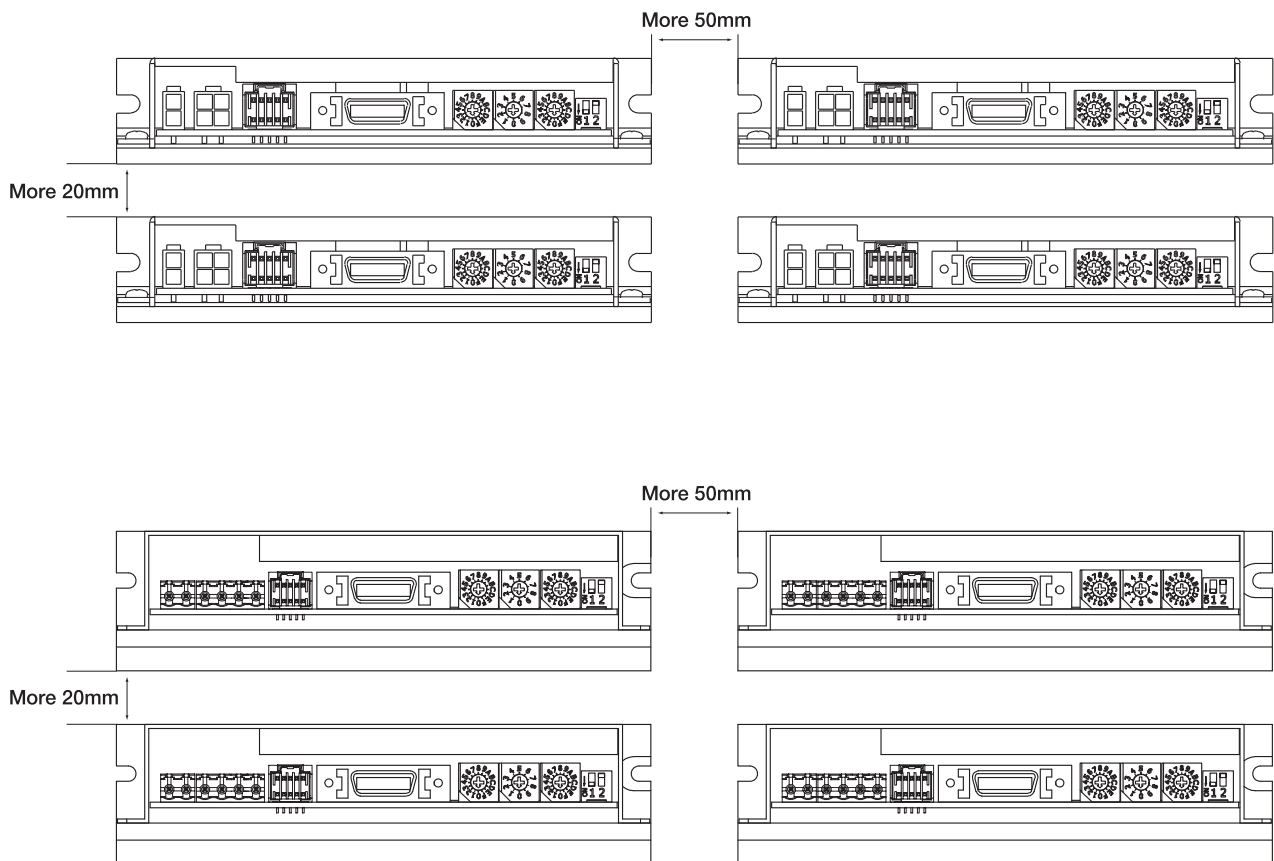
Motor Current = Rated Current(Refer to Motor Specification)

Drive = Ezi-SERVO ST (EzS-PD-86 Series)

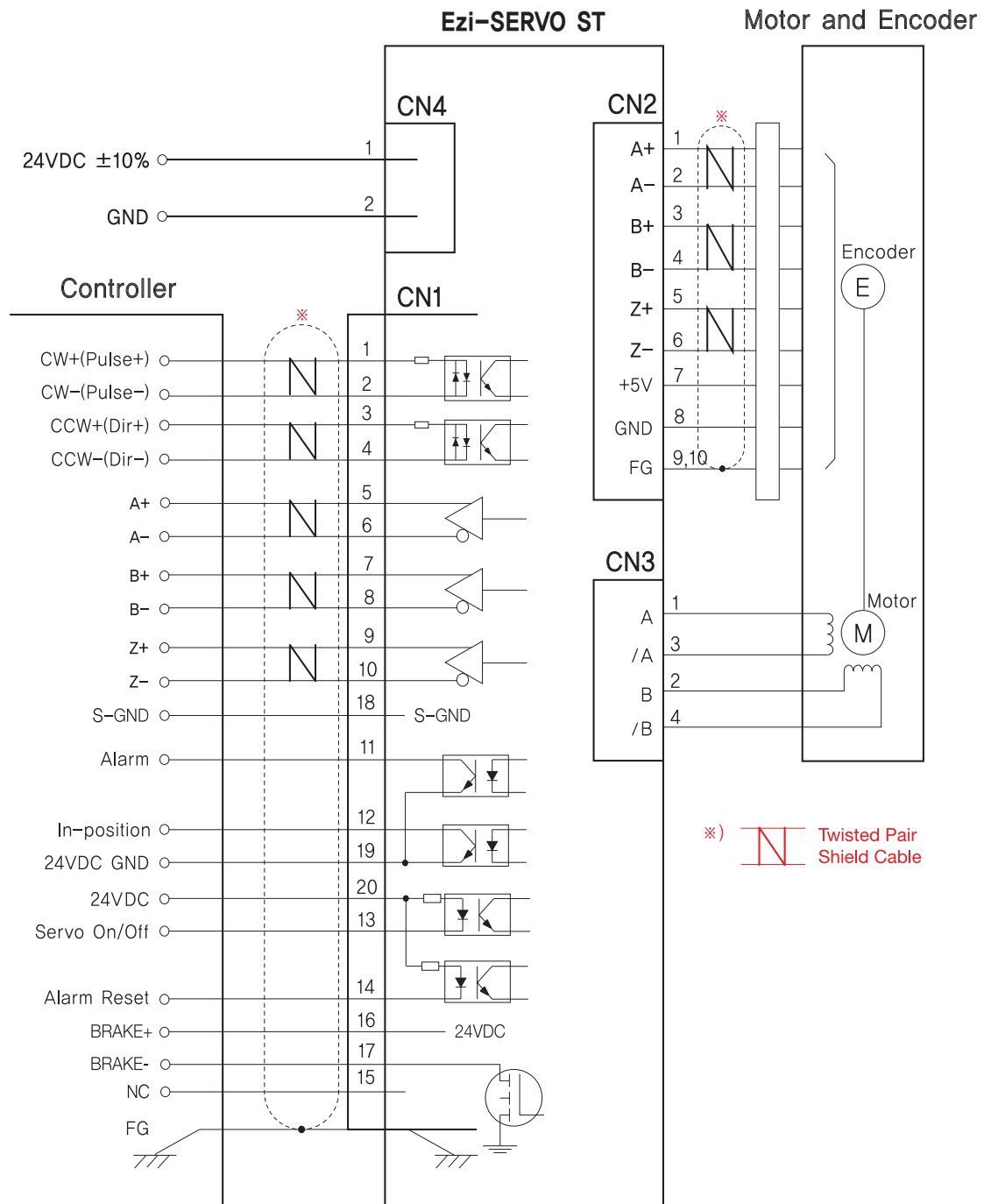
5. Installation and Cabling

5.1 Notes on Installation

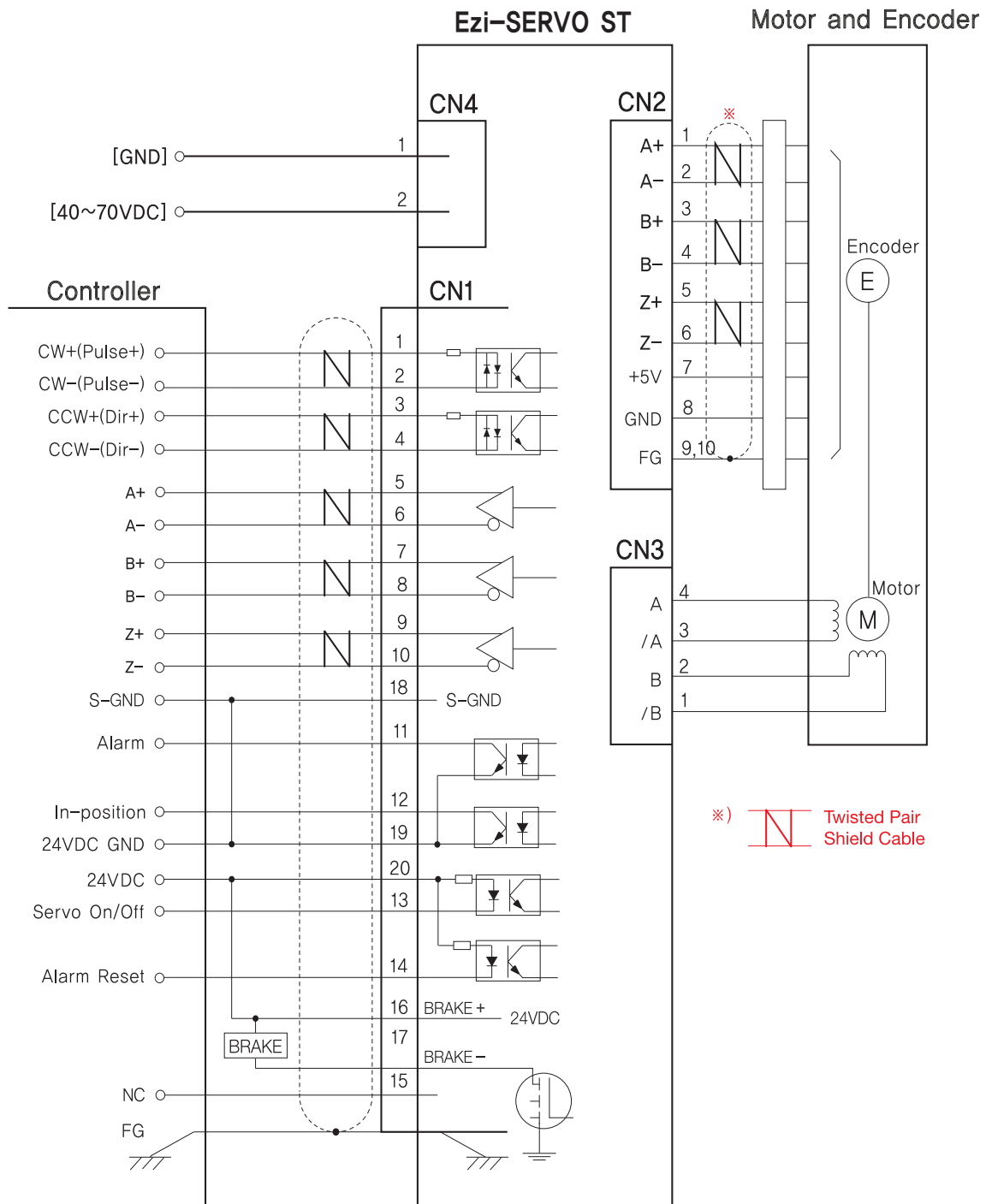
- 1) Ezi-SERVO ST is designed for indoor use only.
- 2) The ambient temperature of the room should be $0^{\circ}\text{C} \sim 50^{\circ}\text{C}$.
- 3) If the temperature of the product case is higher than 50°C , radiate heat of the outside to cool down.
- 4) Do not install Ezi-SERVO ST under direct rays, near magnetic or radioactive objects.
- 5) If you set more than 2 drives, you must set over 20mm horizontally and over 50mm vertically as shown below.



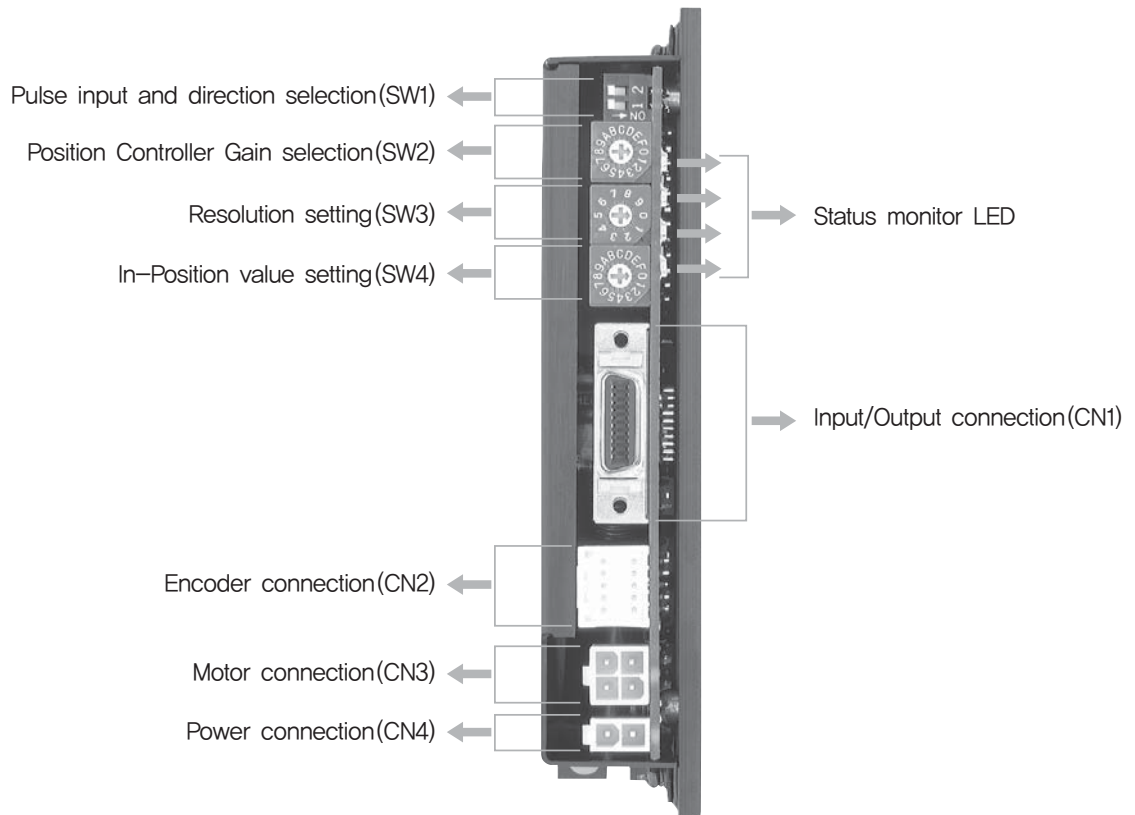
5.2 Connection Diagram



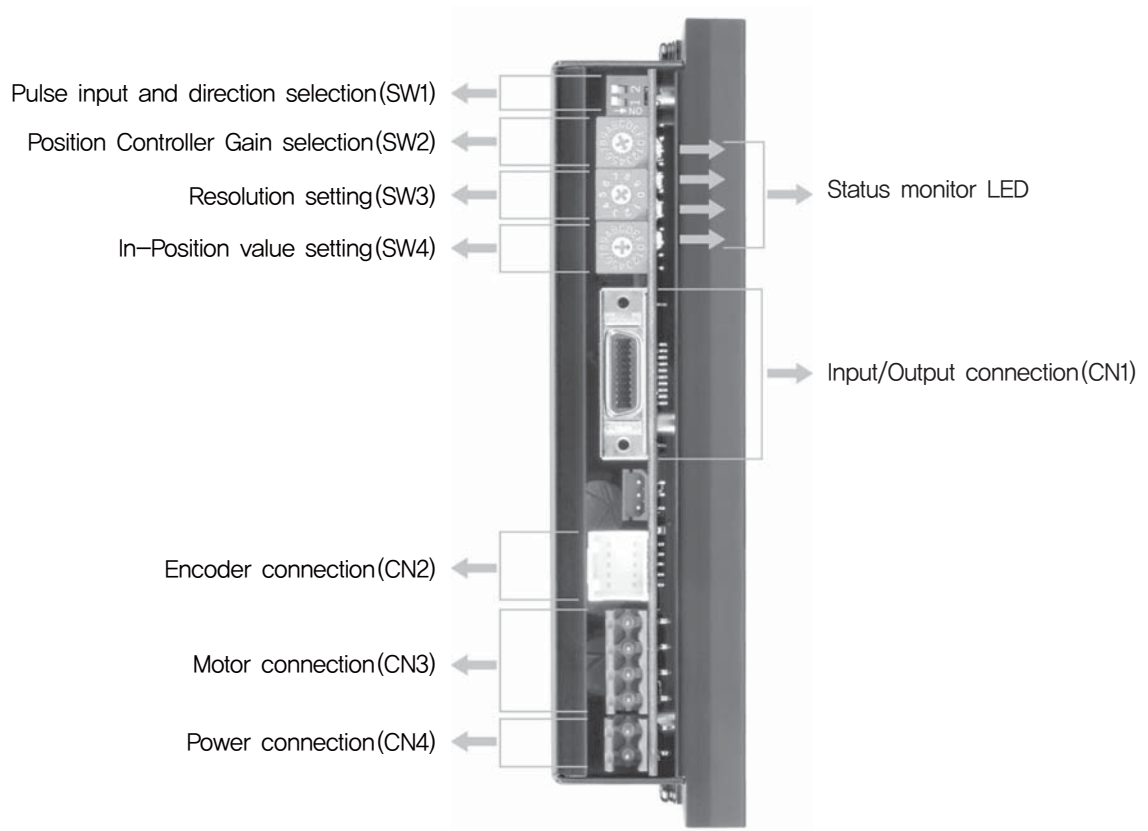
5.2 Connection Diagram (86mm)



6. Setting and Operation



◆ 86mm motor drive only(EzS-PD-86 Series)



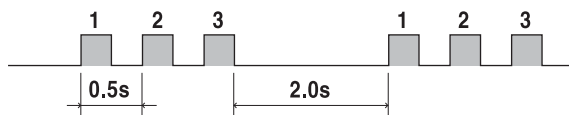
6.1 Monitor Status from LED

6.1.1 Status LED Function and Condition

Status	Color	Function	Flash Condition
PWR	Green	Power Input	Lights when power is On
INP	Yellow	Complete Position Motion	Lights ON when positioning error reaches within the preset pulse selected by rotary switch
SON	Orange	Servo On/Off Indication	Servo On : Lights On Servo Off : Lights Off
ALM	Red	Alarm Indication	Flash when protection function is activated (Identifiable which protection mode is activated by counting the LED flash times)

6.1.2 Protection functions and LED flash times

Times	Protection	Conditions
1	Over Current Error	The current through power devices in inverter exceeds the limit value
2	Over Speed Error	Motor speed exceed 3,000rpm
3	Position Tracking Error	Position error value is higher than 90° in motor run state
4	Over Load Error	The motor is continuously operated more than 5 second under a load exceeding the max. torque
5	Over Temperature Error	Inside temperature of drive exceeds 85℃
6	Over Regeneratived Voltage Error	Back-EMF more high limit value
7	Motor Connect Error	The power is ON without connection of the motor cable to drive
8	Encoder Connect Error	Cable connection error with Encoder connector in drive
9	Motor Voltage Error	Motor voltage is out of limited value
10	In-Position Error	After operation is finished, a position error occurs
11	System Error	Error occurs in drive system
12	ROM Error	Error occurs in parameter storage device(ROM)
14	Input Voltage Error	Power source voltage is out of limited value*3
15	Position Overflow Error	Position error value is higher than 90° in motor stop state

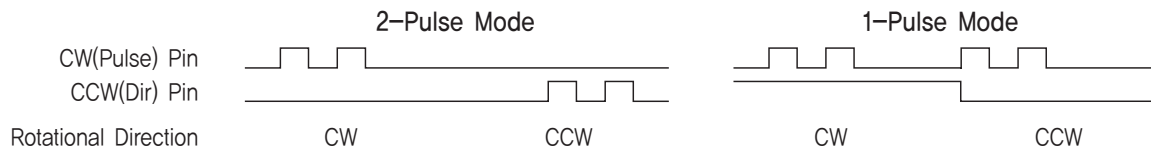


Alarm LED flash
(ex : Position tracking error)

Motor	EzM-20,EzM-28, EzM-42,EzM-56, EzM-60	EzM-86
*1 Over regeneratived voltage	70V	90V
*2 Motor voltage error	20V	36V
*3 Input voltage error	not support	40V~70V

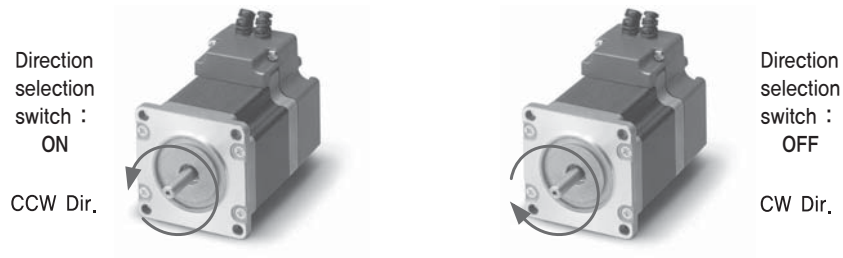
6.2 Pulse Input Selection Switch(SW1.1)

Indication	Switch Name	Functions
2P/1P	Selecting Pulse Input Mode	Selectable 1-Pulse input mode or 2-Pulse input mode as Pulse input signal. ON : 1-Pulse mode OFF : 2-Pulse mode ※Default : 2-Pulse mode



6.3 Rotational Direction Selection Switch(SW1.2)

Indication	Switch Name	Functions
DIR	Switching Rotational Direction	Based on CW(+Dir signal) input to driver. ON : CCW(-Direction) OFF : CW(+Direction) ※Default : CW mode



6.4 Position Controller Gain Select Switch(SW2)

The purpose of the Position Controller is to correct motor position deviation after stopping caused by load and friction. Depending on the motor load, the user have to select position of the switch because the system to be stable and to correct the error as fast as possible.

To turn the controller

- 1.Set the switch to '0' position
- 2.Start to rotate the switch until system becomes stable.
- 3.Rotate the switch +/- 1~2 position to reach better performance.

Indica- tion	Time Constant of Integral Part*1	Proportional Gain*1	Indica- tion	Time Constant of Integral Part*1	Proportional Gain*1	
0*2	1	1	8	2	3	
1	1	2	9	2	4	
2	1	3	A	2	5	
3*2	1	4	B	3	1	
4	1	5	C	3	2	
5	1	6	D	3	3	
6	2	1	E	3	4	
7	2	2	F	3	5	

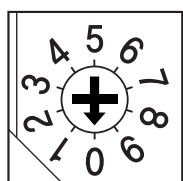
*1 : Values in the columns are in relative units. They only show the parameter changes depending on the switch's position.

*2 : Default : '3'

*3 : This setting can not be used when SW3 and SW4 is set to '0'

6.5 Resolution Set Switch(SW3)

The number of pulse per revolution.

Position	Pulse/Rotation	Position	Pulse/Rotation	
0	500*1	5	3600	
1	500	6	5000	
2	1000	7	6400	
3	1600	8	7200	
4	2000	9	10000*2	

*1 : Resolution value depend on encoder type.

*2 : Default : 10000

Resolution value on position '0' depend on Encoder type as follows

Encoder Type	Resolution value on '0' position
A (10000 / revolution)	500
B (20000 / revolution)	20000
C (32000 / revolution)	32000
D (16000 / revolution)	16000
F (4000 / revolution)	4000

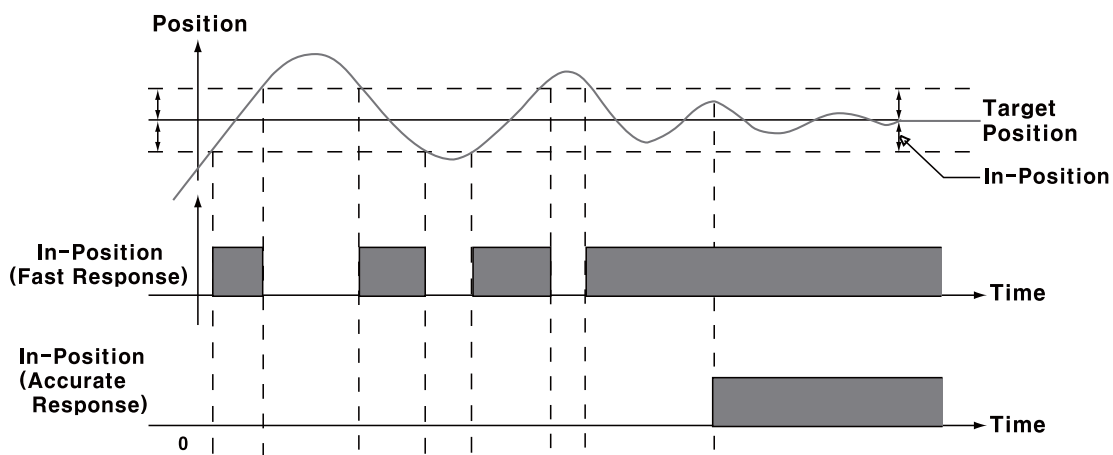
6.6 In-Position Value Set Switch(SW4)

To select the output condition of In-position signal, In-position output signal is generated when the pulse number of position error is lower than selected In-position value set by this switch after positioning command executed.

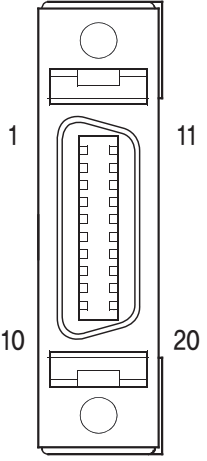
Indica- tion	In-Position [Pulse] Fast Response	Indica- tion	In-Position [Pulse] Accurate Response	
*1 0	0	8	0	
1	1	9	1	
2	2	A	2	
3	3	B	3	
4	4	C	4	
5	5	D	5	
6	6	E	6	
7	7	F	7	

*1 : Default : '0'

6.6.1 Setting method of Fast Response and Accurate Response



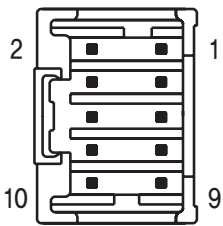
6.7 Control Signal Input/Output Connector (CN1)

Indication	Function	I/O	
1	CW+(Pulse+)	Input	
2	CW-(Pulse-)	Input	
3	CCW+(Dir+)	Input	
4	CCW-(Dir-)	Input	
5	A+	Output	
6	A-	Output	
7	B+	Output	
8	B-	Output	
9	Z+	Output	
10	Z-	Output	
11	Alarm	Output	
12	In-Position	Output	
13	Servo On/Off	Input	
14	Alarm Reset	Input	
15	NC	----	
16	BRAKE+	Output	
17	BRAKE-	Output	
18	S-GND	Output	
19	24VDC GND	Input	
20	24VDC	Input	

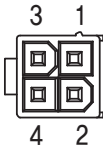
※ BRAKE function is Optional.

※ There is no BRAKE function for 86mm motor drive

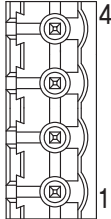
6.8 Encoder Connector (CN2)

Indication	Function	I/O	
1	A+	Input	
2	A-	Input	
3	B+	Input	
4	B-	Input	
5	Z+	Input	
6	Z-	Input	
7	5VDC	Output	
8	5VDC GND	Output	
9	Frame GND	----	
10	Frame GND	----	

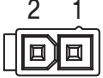
6.9 Motor Connector(CN3)

Indication	Function	
1	A Phase	
2	B Phase	
3	/A Phase	
4	/B Phase	

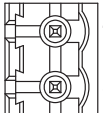
◆ Only for 86mm motor drive

Indication	Function	
1	/B Phase	
2	B Phase	
3	/A Phase	
4	A Phase	

6.10 Power Connector(CN4)

Indication	Function	
1	Input Power : 24VDC $\pm 10\%$	
2	Input Power : GND	

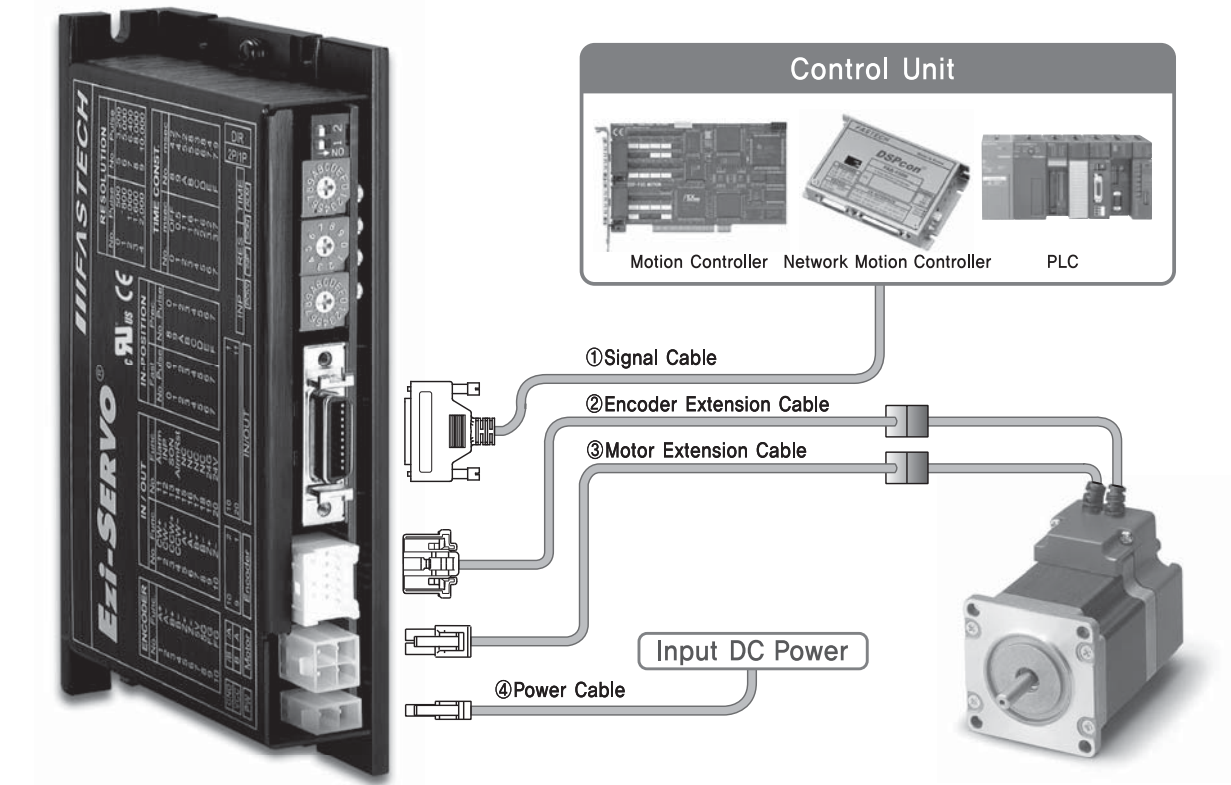
◆ Only for 86mm motor drive

Indication	Function	
1	Input Power : GND	
2	Input Power : 40~70VDC	

6.11 Run Current

There's no need to adjust because the run current is set with comparing to the kind of motor. But, the run current is 50% when motor is stopped.

7. System Configuration



Type	Signal Cable	Encoder Cable	Motor Cable	Power Cable
Standard Length	—	30cm	30cm	—
Max. Length	20m	20m	20m	2m

※ Standard cable length of Motor and Encoder is 30cm, Extension Cable is needed to extend this limitation(Option)

7.1 Cable Option

① Signal Cable

Available to connect between Control System and Ezi-SERVO ST.

Item	Length[m]	Remark
CSVO-S-□□□F	□□□	Normal Cable
CSVO-S-□□□M	□□□	Robot Cable

□ is for Cable Length, The unit is 1m and Max, 20m length,

③ Motor Extension Cable

Available to extended connection between motor and Ezi-SERVO ST.

Item	Length[m]	Remark
CSVO-M-□□□F	□□□	Normal Cable
CSVO-M-□□□M	□□□	Robot Cable

□ is for Cable Length, The unit is 1m and Max, 20m length,

② Encoder Extension Cable

Available to extended connection between motor and Ezi-SERVO ST.

Item	Length[m]	Remark
CSVO-E-□□□F	□□□	Normal Cable
CSVO-E-□□□M	□□□	Robot Cable

□ is for Cable Length, The unit is 1m and Max, 20m length,

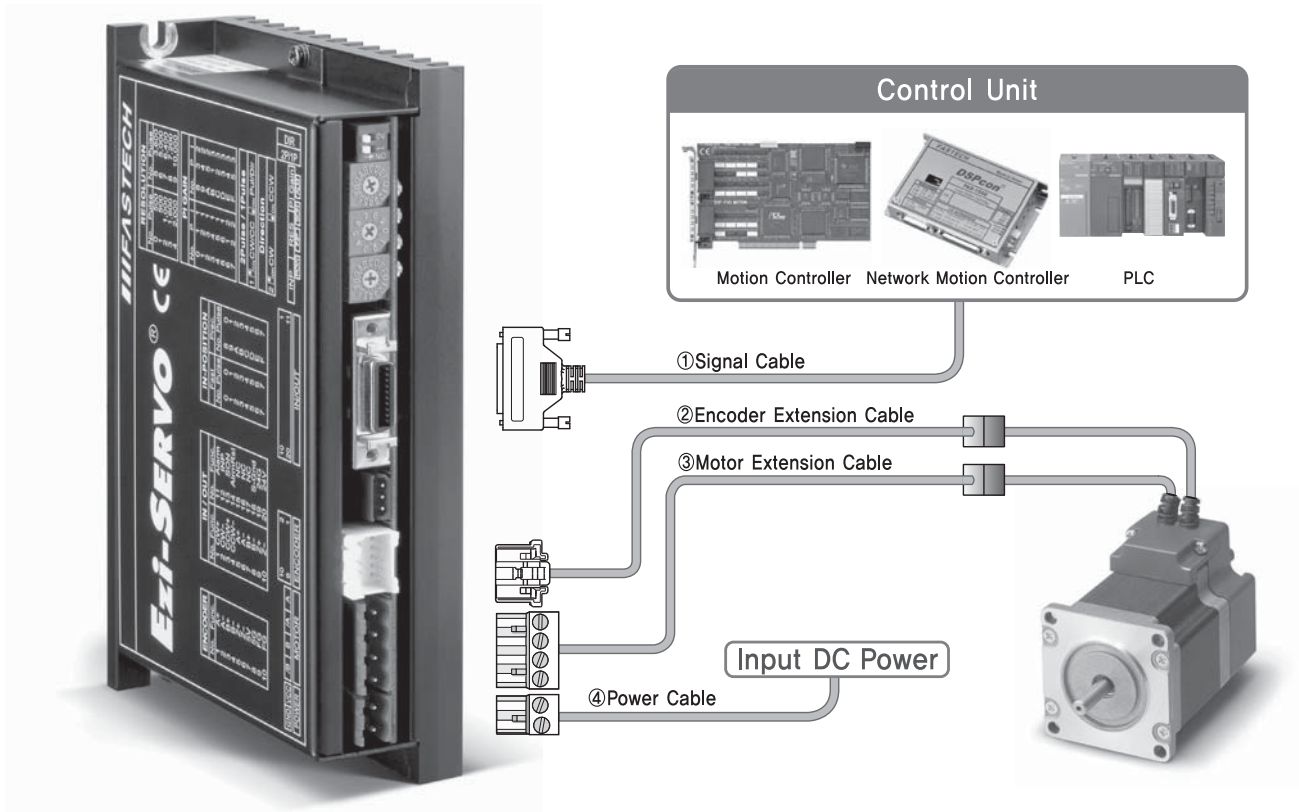
④ Power Cable

Available to extended connection between motor and Ezi-SERVO ST.

Item	Length[m]	Remark
CSVO-P-□□□F	□□□	Normal Cable

□ is for Cable Length, The unit is 1m and Max, 2m length,

8. System Configuration[Only for 86mm motor drive(EzS-PD-86 Series)]



Type	Signal Cable	Encoder Cable	Motor Cable	Power Cable
Standard Length	—	30cm	30cm	—
Max. Length	20m	20m	20m	2m

※ Standard cable length of Motor and Encoder is 30cm, Extension Cable is needed to extend this limitation(Option)

8.1 Cable Option

① Signal Cable

Available to connect between Control System and EzS-SERVO ST.

Item	Length[m]	Remark
CSVO-S-□□□F	□□□	Normal Cable
CSVO-S-□□□M	□□□	Robot Cable

□ is for Cable Length, The unit is 1m and Max, 20m length.

③ Motor Extension Cable

Available to extended connection between motor and EzS-SERVO ST.

Item	Length[m]	Remark
CSVP-M-□□□F	□□□	Normal Cable
CSVP-M-□□□M	□□□	Robot Cable

□ is for Cable Length, The unit is 1m and Max, 20m length.

② Encoder Extension Cable

Available to extended connection between motor and EzS-SERVO ST.

Item	Length[m]	Remark
CSVO-E-□□□F	□□□	Normal Cable
CSVO-E-□□□M	□□□	Robot Cable

□ is for Cable Length, The unit is 1m and Max, 20m length.

④ Power Cable

Available to extended connection between motor and EzS-SERVO ST.

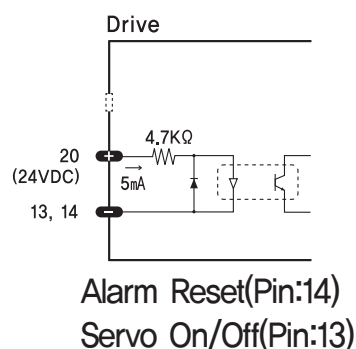
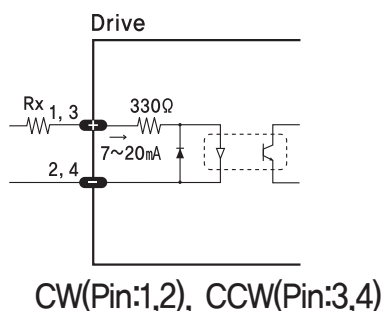
Item	Length[m]	Remark
CSVP-P-□□□F	□□□	Normal Cable

□ is for Cable Length, The unit is 1m and Max, 2m length.

9. Control Signal Input/Output Description

1 Input Signal

Input signals of the drive are all photocoupler inputs. The signal shows the status of internal photocouplers [ON : conduction], [OFF : Non-conduction], not displaying the voltage levels of the signal.



◆CW, CCW Input

This signal can be used to receive a positioning pulse command from a user host motion controller. A user can select 1-pulse input mode or 2-pulse input mode (refer to switch No.1, SW1).

The input schematic of CW, CCW is designed for 5V TTL level. When using 5V level as an input signal, the resistor Rx is not used and connect to the driver directly.

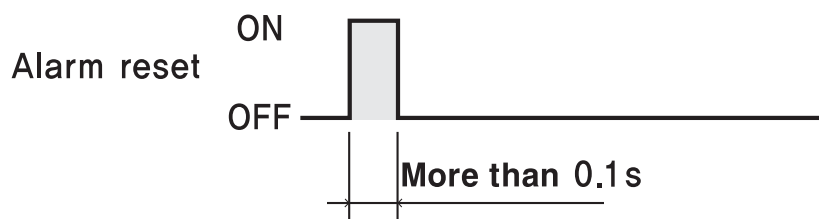
When the level of input signal is more than 5V, Rx Resistor is required. If the resistor is absent, the drive will be damaged! In input signal level is 12V case, Rx value is 680ohm and in 24V case, 1.8kohm is suitable for Rx value.

◆Servo On/Off Input

This input can be used only to adjust the position by manually moving the motor shaft from the load-side. By setting the signal [ON], the driver cuts off the power supply to the motor. Then, one can manually adjust output position. When setting the signal back to [OFF], the driver resumes the power supply to the motor and recovers the holding torque. When driving a motor, one needs to set the signal [OFF].

◆Alarm Reset Input

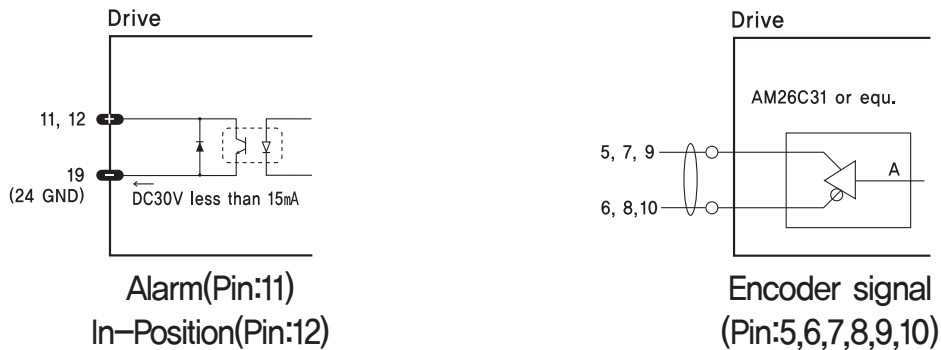
When a protection mode has been activated, a signal to this alarm reset input cancels the Alarm output.



※ By setting the alarm reset input signal [ON], cancel the Alarm output. Before cancel the Alarm output, have to remove the source of Alarm.

2 Output Signal

Output signals from the driver are photocoupler outputs : Alarm, In-Position and the line driver outputs(encoder signal). In the case of photocoupler outputs, the signal indicates the status of internal photocouplers [ON: conduction], [OFF: Non-conduction], not displaying the voltage levels of the signal.



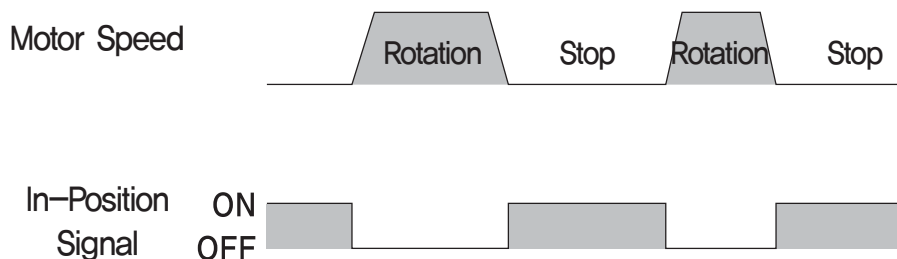
◆Alarm Output

The Alarm output indicates [ON] when the driver is in a normal operation. If a protection mode has been activated, it goes [OFF]. A host controller needs to detect this signal and stop sending a motor driving command. When the driver detects an abnormal operation such as overload or overcurrent of the motor, it sets the Alarm output to [OFF], blinks the Alarm LED, disconnect the power to a motor and stop the motor simultaneously.

[Caution] Only at the Alarm output port, the photocoupler operation is in reverse. When the driver is in normal operation the Alarm output is [ON]. On the contrary when the driver is in abnormal operation that start protection mode, the Alarm output is [OFF].

◆In-Position Output

In-Position signal is [ON] when positioning is completed. This signal is [ON] when the motor position error is within the value set by the switch SW4



[Caution] In-Position signal is [ON] when low speed(under 50[pps]) Motioning even if The position command is not finished.

◆Encoder Signal Output

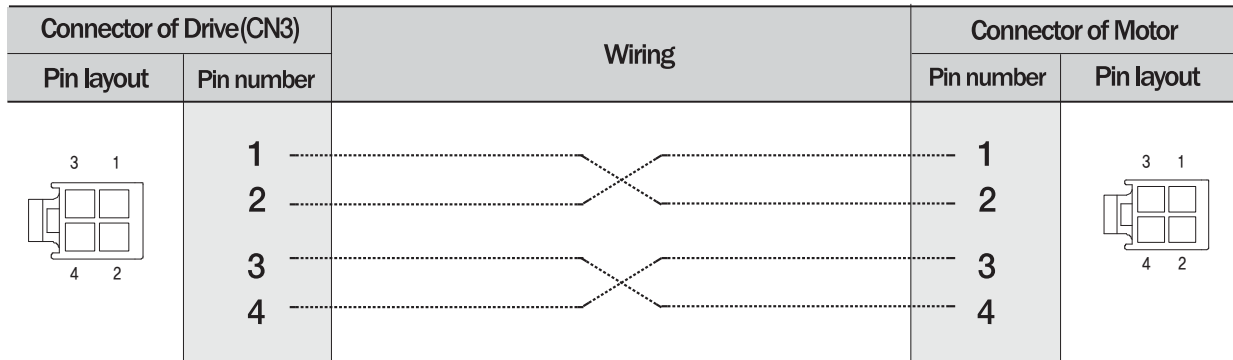
The encoder signal is a line drive output. This can be used to confirm the stop position.

Appendix

■ Extension Cable for Motor

For cable extension between Motor and Drive.

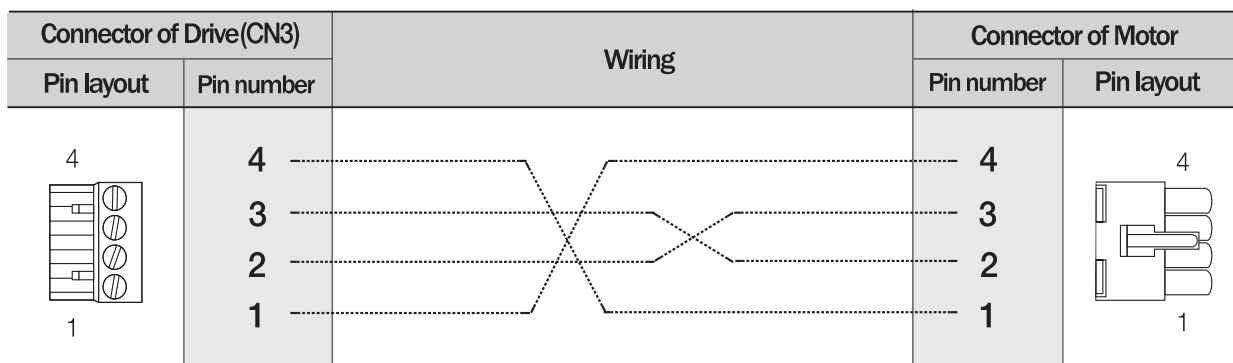
WIRING DIAGRAM



CONNECTOR

ITEM	Part Number	Maker
Housing	5557-04R	MOLEX
Terminal	5556T	MOLEX

WIRING DIAGRAM(86mm drive only)



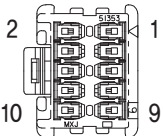
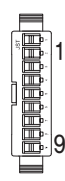
CONNECTOR(86mm drive only)

ITEM		Part Number	Maker
Drive Connector(CN3)	Terminal Block	AK950-4	PTR
Motor Connector	Housing Terminal	3191-4RI 1381T	MOLEX MOLEX

■ Extension Cable for Encoder

For cable extension between Encoder and Drive.

WIRING DIAGRAM

Connector of Drive(CN2)		Wiring	Connector of Motor	
Pin layout	Pin number		Pin number	Pin layout
	1	-----	1	
	2	-----	2	
	3	-----	3	
	4	-----	4	
	5	-----	5	
	6	-----	6	
	7	-----	7	
	8	-----	8	
	9	-----	9	
	10			

CONNECTOR

ITEM		Part Number	Maker
Drive Connector(CN2)	Housing	51353-1000	MOLEX
	Terminal	56134-9000	MOLEX
Motor Connector	Housing	SMP-09V-NC	JST
	Terminal	SHF-001T-0.8BS	JST

■ Connector

Connector specifications for cabling to Ezi-SERVO ST.

ITEM		Part Number	Maker	
Power(CN4)	Housing Terminal	5557-02R 5556T	MOLEX MOLEX	
	Terminal Block	AK950-2	PTR	86mm motor drive only
Motor	Drive Side (CN3)	Housing Terminal	5557-04R 5556T	MOLEX MOLEX
		Terminal Block	AK950-4	PTR
	Motor Side	Housing Terminal	5557-04R 5556T	MOLEX MOLEX
		Housing Terminal	3191-4RI 1381T	MOLEX MOLEX
Encoder	Drive Side (CN2)	Housing Terminal	51353-1000 56134-9000	MOLEX MOLEX
	Encoder Side	Housing Terminal	SMP-09V-NC SHF-001T-0.8BS	JST JST
Signal (CN1)		Connector Backshell	10120-3000VE 10320-52AO-008	3M 3M

※ These connectors are serviced together with Ezi-SERVO ST except when purchasing option cables.

※ Above connector is the most suitable product for Ezi-SERVO ST. Another equivalent connector can be used.

Advantages over Open-Loop Control Stepping Drive

1. Reliable positioning without loss of synchronism.
2. Holding stable position and automatically recovering to the original position even after experiencing positioning error due to a external force, such as mechanical vibration or vertical positioning holding.
3. Ezi-SERVO utilizes 100% full range of the rated motor torque, contrary to a conventional open-loop stepping drive that can use only up to 50% of the rated motor torque by considering loss of synchronism.
4. Capability to operate at high speed due to load-dependent current control, open-loop stepper drives use a constant current control at all speed range without considering load variations.

Advantages Over Servo Motor Controller

1. No gain tuning (Automatic adjustment of gain in response to a load change)
2. Maintain the stable holding position without fluctuation after completing positioning.
3. Fast positioning due to the independent control by on-board DSP.
4. Continuous operation during rapid short-stroke movement due to instantaneous positioning.

▪ Memo



Fast, Accurate, Smooth Motion

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● Please note that the specifications are subject to change without notice due to product improvements.

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